Hole's Human Anatomy and Physiology

Twelfth Edition

Shier ◆ Butler ◆ Lewis

Chapter 5 Tissues

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5.1: Introduction

- **Similar cells with a common function are called tissues.**

- **The study of tissues is called histology.**

- **There are four (4) primary or major tissue types:**

1. **Epithelial Tissue**
2. **Connective Tissue**
3. **Muscle Tissue**
4. **Nervous Tissue**

Intercellular Junctions

Tight junctions

- Close space between cells
- Located among cells that form linings

Desmosomes

- Form “spot welds” between ce
- Located among outer skin cel

Gap junctions

- Tubular channels between cel
- Located in cardiac muscle cel

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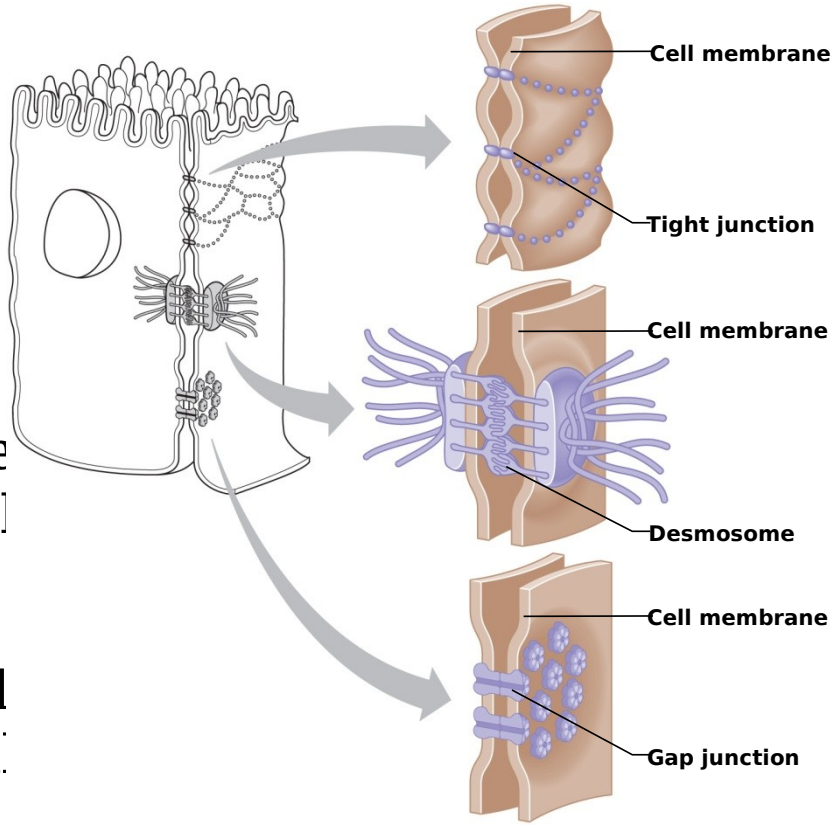

5.2: Epithelial Tissue

- **General characteristics:**
  - **Cover organs and the body**
    - **Line body cavities**
    - **Line hollow organs**
    - **Have a free surface**
  - **Have a basement membrane**
    - **Are avascular**
    - **Cells readily divide**
    - **Cells tightly packed**
  - **Cells often have desmosomes**
      - **Function in protection, secretion, absorption, and excretion**
- **Classified according to cell shape and number of cell la**

Epithelial Tissue

- **Simple squamous:**
  - **Single layer of flat cells**
  - **Substances pass easily through**
  - **Line air sacs**
  - **Line blood vessels**
  - **Line lymphatic vessels**

- **Simple cuboidal:**
  - **Single layer of cube-shaped cells**
  - **Line kidney tubules**
  - **Cover ovaries**
  - **Line ducts of some glands**

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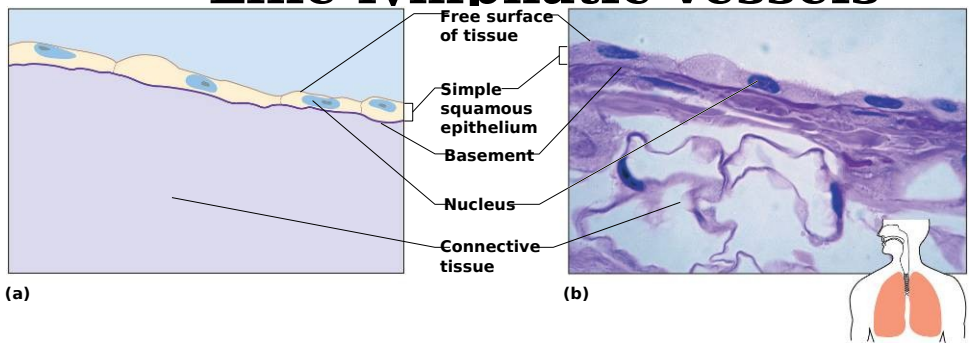

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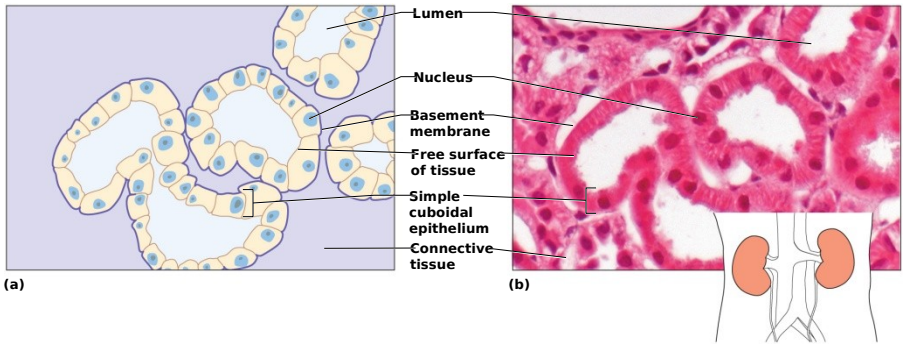

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Epithelial Tissue

Simple columnar:

- Single layer of elongated cells
- Nuclei usually near the basement
- Membrane at same level
- Sometimes possess cilia
- Sometimes possess microvilli
- Often have goblet cells
- Line uterus, stomach, intestines

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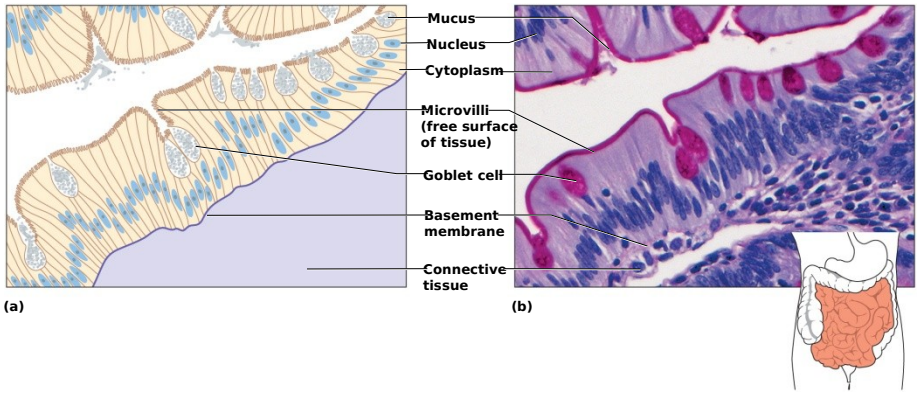

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• Pseudostratified columnar:

- Single layer of elongated cells
- Nuclei at two or more levels
- Appear striated
- Often have cilia

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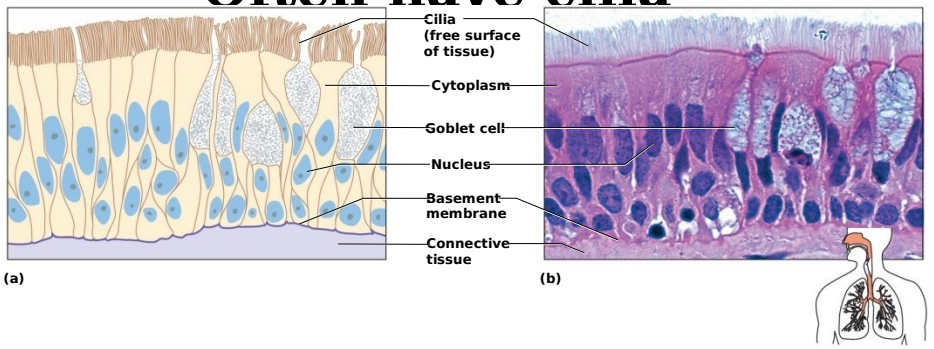

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Epithelial Tissue

- **Stratified squamous:**
  - Many cell layers
  - Top cells are flat
  - Can accumulate keratin
  - Outer layer of skin
  - Line oral cavity, vagina and anal canal

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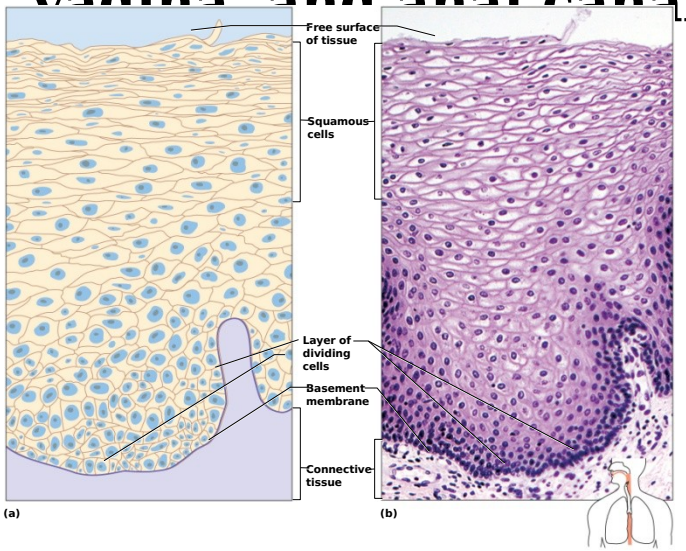

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- **Stratified cuboidal:**
  - 2-3 layers
  - Cube-shaped cells
  - Line ducts of mammary glands, sweat glands, salivary glands, and the pancreas

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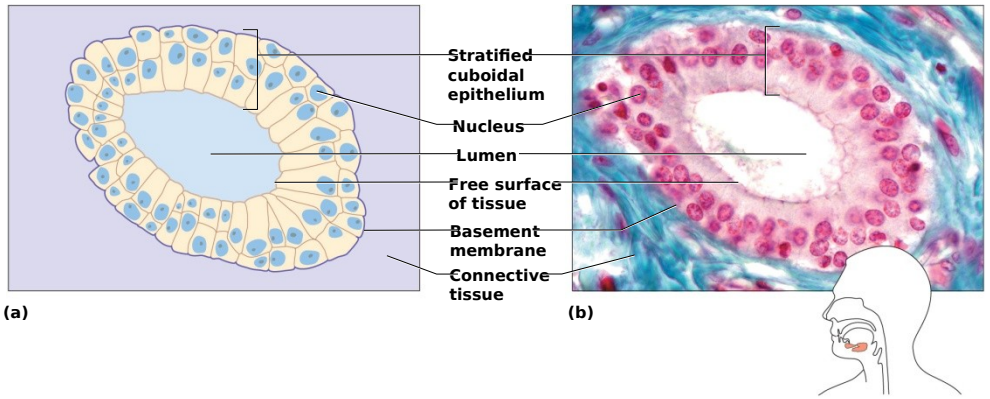

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Epithelial Tissue

- **Stratified columnar:**
  - **Top layer of elongated cells**
  - **Cube-shaped cells in deeper layers**
  - **Line part of male urethra and part of pharynx**

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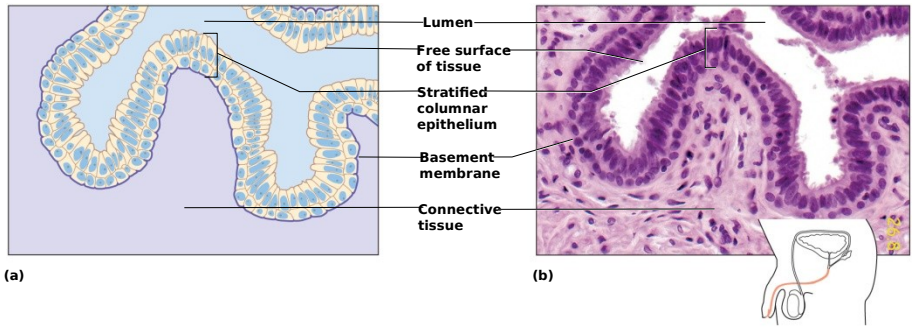

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- **Transitional:**
  - **Many cell layers**
  - **Cube-shaped and elongated cells**
  - **Line urinary bladder, ureters, and part of urethra**

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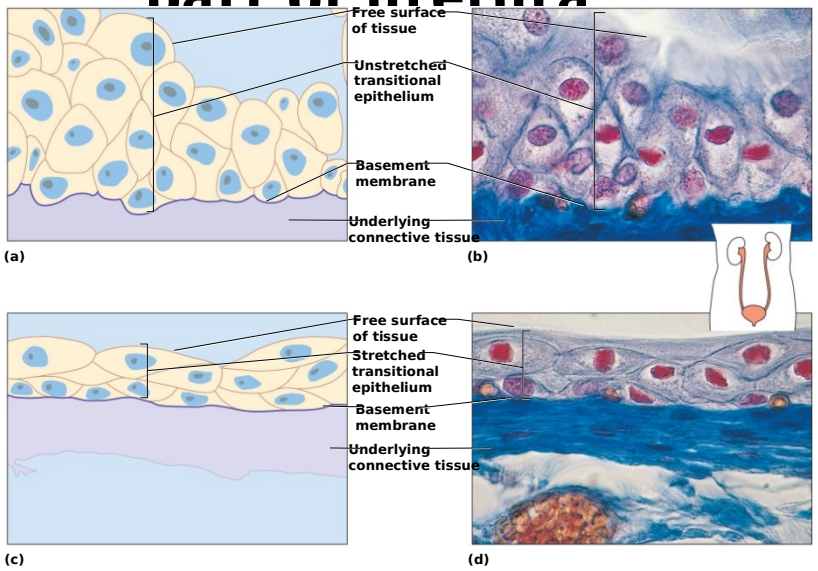

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Glandular Epithelium

- **Composed of cells that are specialized to produce and secrete substances**

There are two (2) types:

- **Endocrine glands are ductless (key word: hormone)**
- **Exocrine glands have ducts**
  - **Unicellular exocrine gland:**
    - **Composed of one cell**
    - **Goblet cell**
  - **Multicellular exocrine gland:**
    - **Composed of many cells**
    - **Sweat glands, salivary glands, etc.**
    - **Simple and compound**

Structural Types of Exocrine Glands

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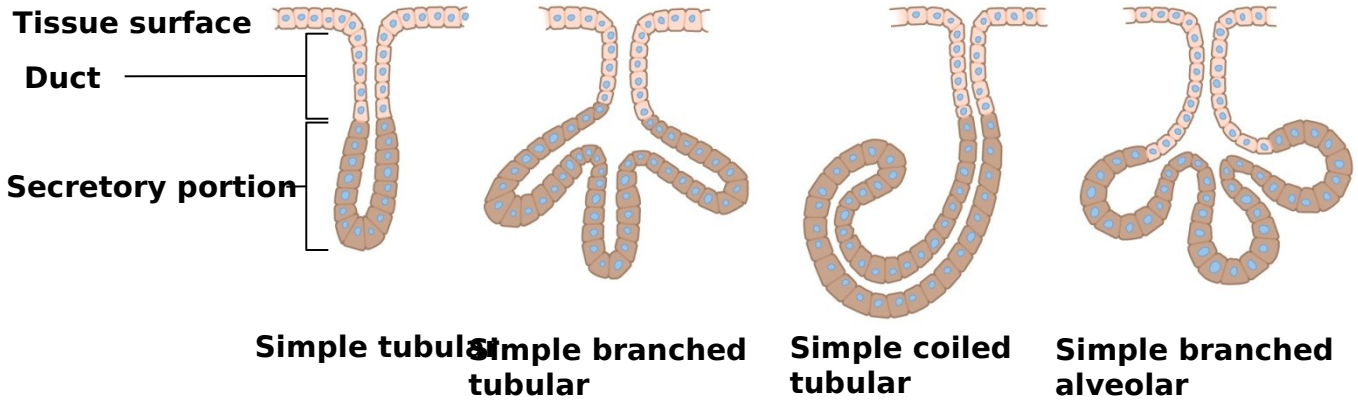

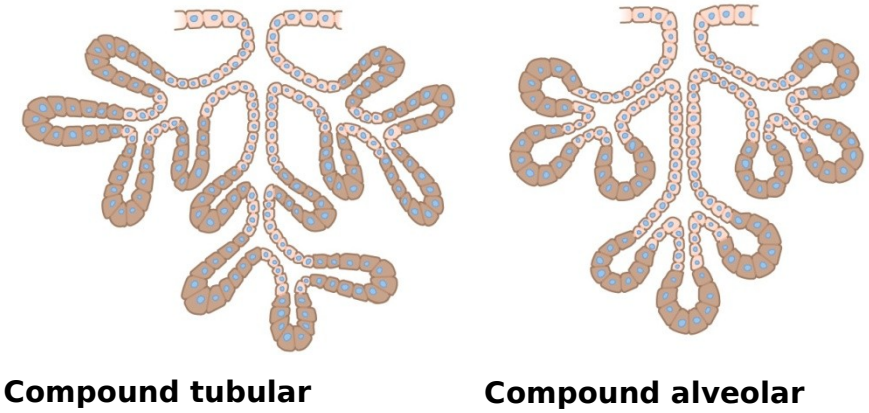

Types of Glandular Secretions

- **Merocrine Glands**
  - Fluid product
  - Salivary glands
  - Pancreas gland (?)
  - Sweat glands
- **Apocrine Glands**
  - Cellular product
  - Portions of cells
  - Mammary glands
  - Ceruminous glands
- **Holocrine Glands**
  - Secretory products
  - Whole cells
  - Sebaceous glands

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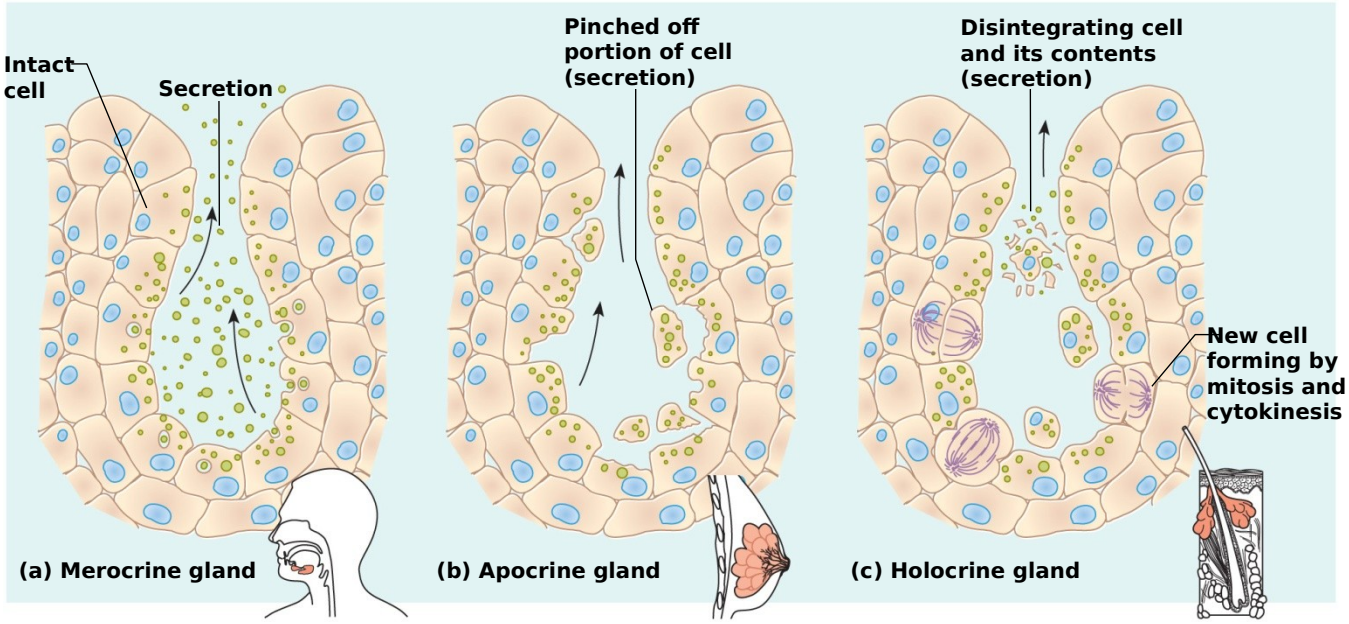

5.3: Connective Tissues

- **General characteristics:**
  - **Most abundant tissue type**
  - **Many functions:**
    - **Bind structures**
    - **Provide support and protection**
    - **Serve as frameworks**
    - **Fill spaces**
    - **Store fat**
    - **Produce blood cells**
    - **Protect against infections**
    - **Help repair tissue damage**
  - **Have a matrix**
  - **Have varying degrees of vascularity**
  - **Have cells that usually divide**

Connective Tissue Major Cell Types Present

- **Fibroblasts**
  - **Fixed cell**
  - **Most common cell**
  - **Large, star-shaped**
  - **Produce fibers**
- **Mast cells**
  - **Fixed cell**
  - **Release heparin**
  - **Release histamine**
- **Macrophages**
  - **Wandering cell**
  - **Phagocytic**
  - **Important in injury or infection**

Connective Tissue Fiber Types Present

- **Collagenous fibers**
  - Thick
  - Composed of collagen
  - Great tensile strength
  - Abundant in dense CT
  - Hold structures together
  - Tendons, ligaments
- **Elastic fibers**
  - Bundles of microfibrils embedded in elastin
  - Fibers branch
  - Elastic
  - Vocal cords, air passages
- **Reticular fibers**
  - Very thin collagenous fibers
  - Highly branched
  - Form supportive networks

Connective Tissues

Connective Tissue Proper

- Loose connective tissue
- Adipose tissue
- Reticular connective tissue
- Dense connective tissue
- Elastic connective tissue

Specialized Connective Tissu

- Cartilage
- Bone
- Blood

Connective Tissue Types

- **Loose Connective Tissue**
  - Mainly fibroblasts
  - Fluid to gel-like matrix
  - Collagenous fibers
  - Elastic fibers
  - Bind skin to structures
  - Beneath most epithelia

- **Adipose Tissue**
  - Adipocytes
  - Cushions
  - Insulates
  - Store fats
  - Beneath skin
  - Behind eyeballs
  - Around kidneys and heart

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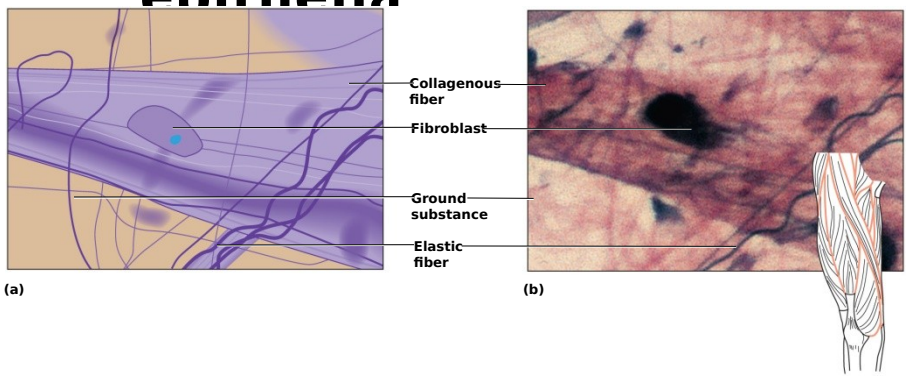

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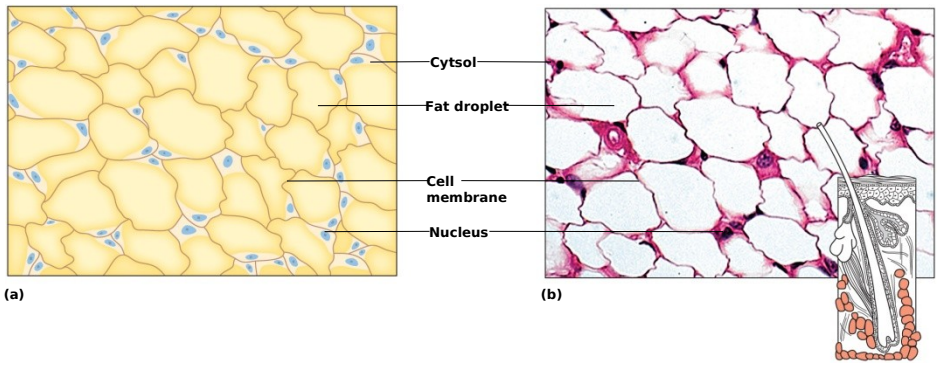

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Connective Tissue Types

- **Reticular Connective Tissue**
  - Composed of reticular fibers
  - Supports internal organ walls
  - Walls of liver, spleen, lymphatic organs
- **Dense Connective Tissue**
  - Packed collagenous fibers
  - Elastic fibers
  - Few fibroblasts
  - Bind body parts together
  - Tendons, ligaments, dermis
  - Poor blood supply

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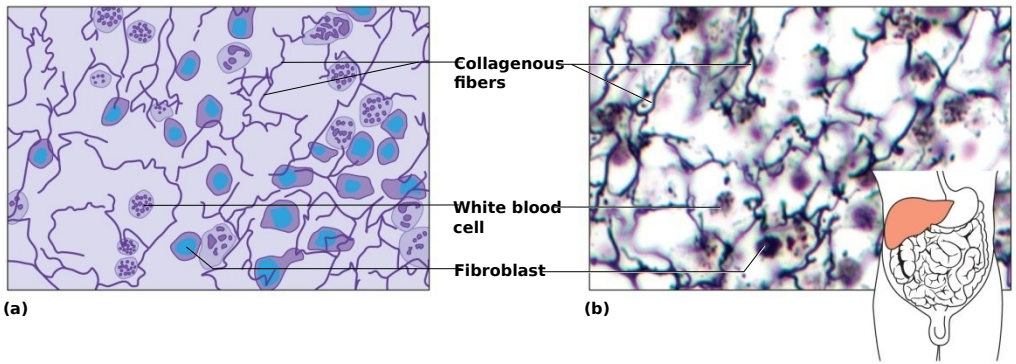

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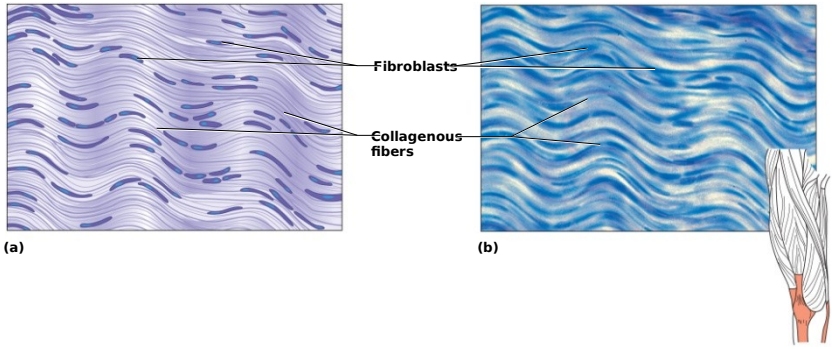

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Connective Tissue Types

Elastic Connective Tissue

- Abundant in elastic fibers
- Some collagenous fibers
- Fibroblasts
- Attachments between bones
- Walls of large arteries, airways, heart

Bone (Osseous Tissue)

- Solid matrix
- Supports
- Protects
- Forms blood cells
- Attachment for muscles
- Skeleton
- Osteocytes in lacunae

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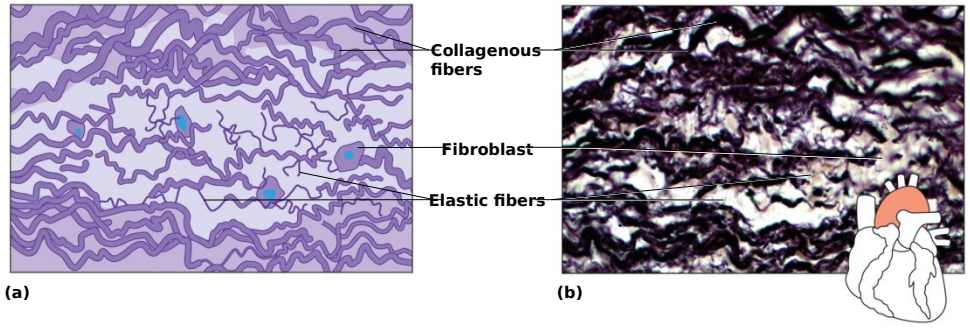

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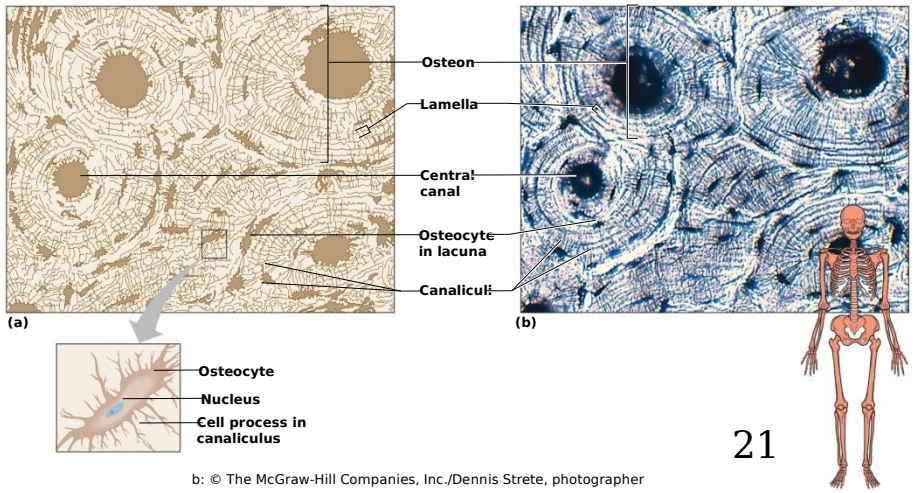

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Connective Tissue Types

- **Cartilage**
  - Rigid matrix
  - Chondrocytes in lacunae
  - Poor blood supply
  - Three (3) types:
    - Hyaline Cartilage
    - Elastic Cartilage
    - Fibrocartilage

- **Hyaline cartilage**
  - Most abundant
  - Ends of bones
  - Nose, respiratory passages
  - Embryonic skeleton

- **Elastic cartilage**
  - Flexible
  - External ear, larynx

- **Fibrocartilage**
  - Very tough
  - Shock absorber
  - Intervertebral discs
  - Pads of knee and pelvic girdle

Connective Tissue Types

Three (3) types of cartilage:

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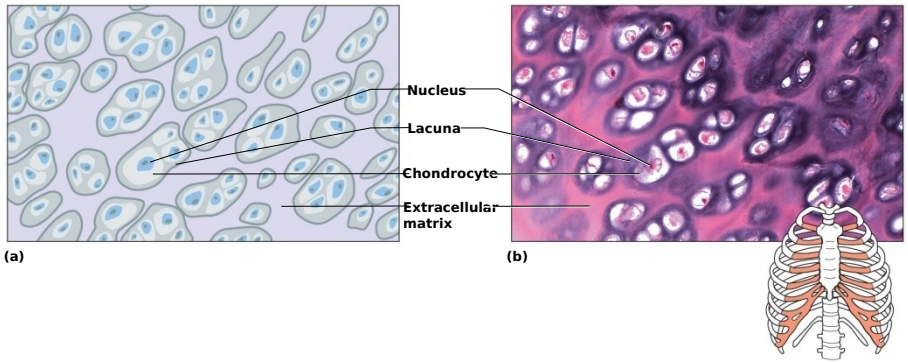

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Hyaline Cartilage

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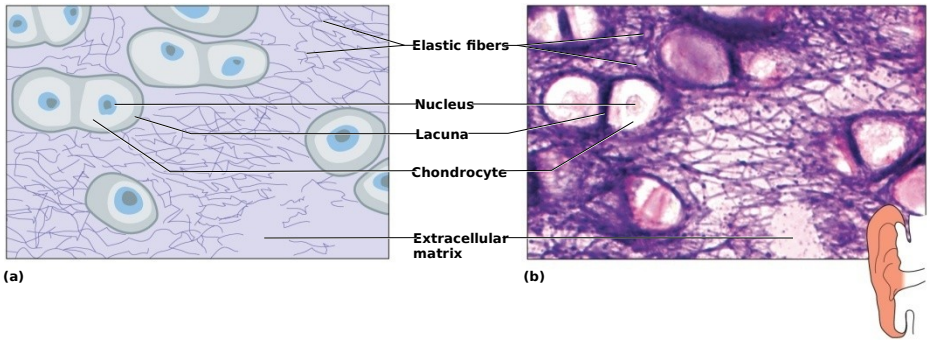

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Elastic Cartilage

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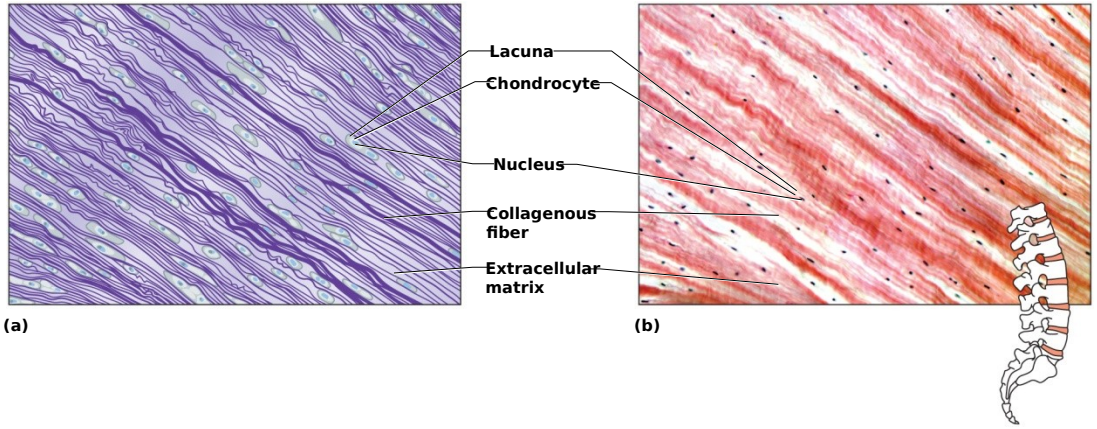

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Fibrocartilage

Connective Tissue Types

- **Blood**
  - **Fluid matrix called plasma**
  - **Red blood cells**
  - **White blood cells**
  - **Platelets**
  - **Transports**
  - **Defends**
  - **Involved in clotting**
  - **Throughout body in blood vessels**
  - **Heart**

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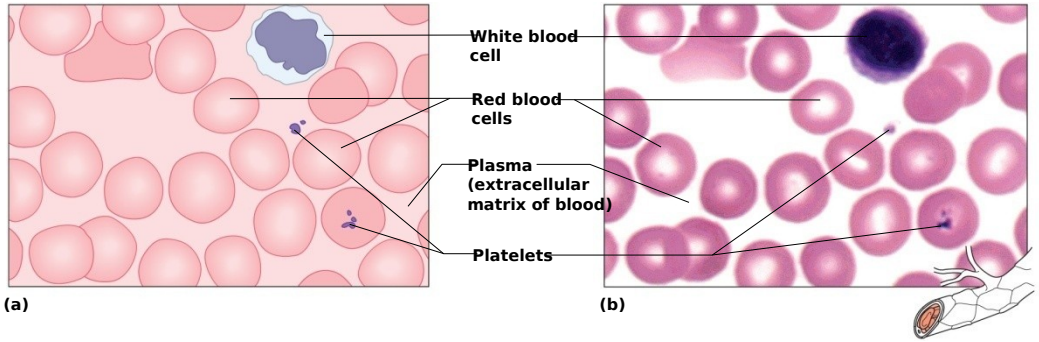

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5.4: Types of Membranes

There are four (4) types of epithelial membranes:

1. Serous Membranes

- **Line body cavities that do not open to the outside**
- **Reduce friction**
- **Inner lining of thorax and abdomen**
- **Cover organs of thorax and abdomen**
- **Secrete serous fluid**

2. Mucous Membranes

- **Line tubes and organs that open to outside world**
- **Lining of mouth, nose, throat, etc.**
- **Secrete mucus**

3. Cutaneous Membranes

- **Covers body**
- **Skin**

4. Synovial Membranes

- **Composed entirely of connective tissue**
- **Lines joints**

5.5: Muscle Tissues

- **General characteristics:**
  - **Muscle cells also called muscle fibers**
  - **Contractile**
  - **Three (3) types:**
    - **Skeletal muscle**
    - **Smooth muscle**
    - **Cardiac muscle**

- **Skeletal muscle**
  - **Attached to bones**
  - **Striated**
  - **Voluntary**
- **Smooth muscle**
  - **Walls of organs**
  - **Skin**
  - **Walls of blood vessels**
  - **Involuntary**
  - **Non-striated**
- **Cardiac muscle**
  - **Heart wall**
  - **Involuntary**
  - **Striated**
  - **Intercalated discs**

Muscle Tissue

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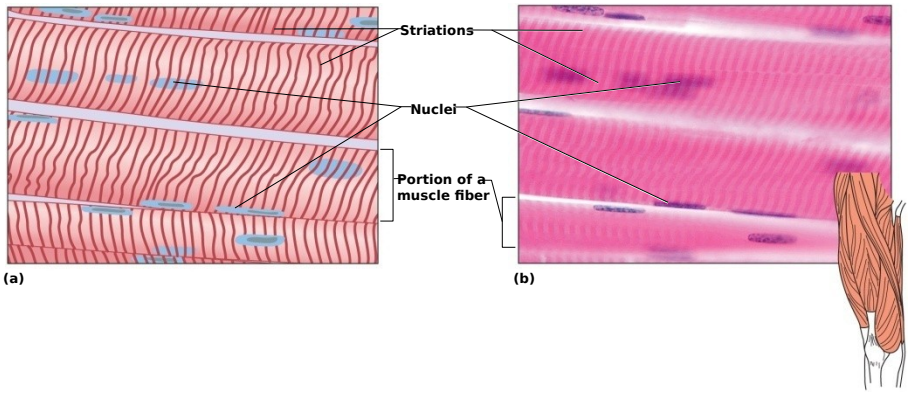

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Skeletal Muscle

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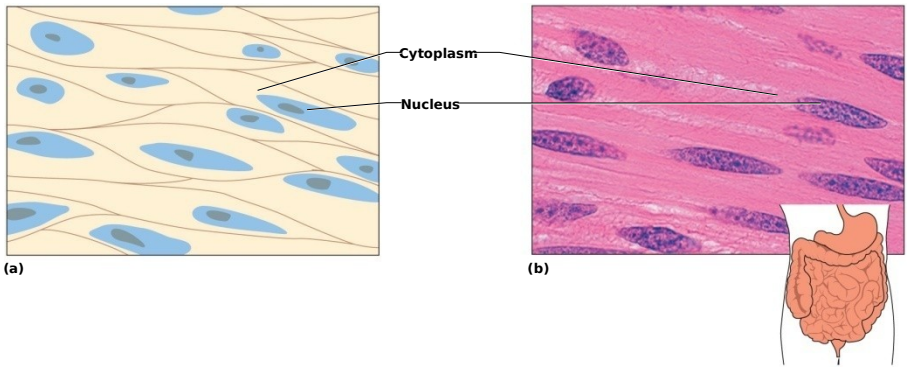

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Smooth Muscle

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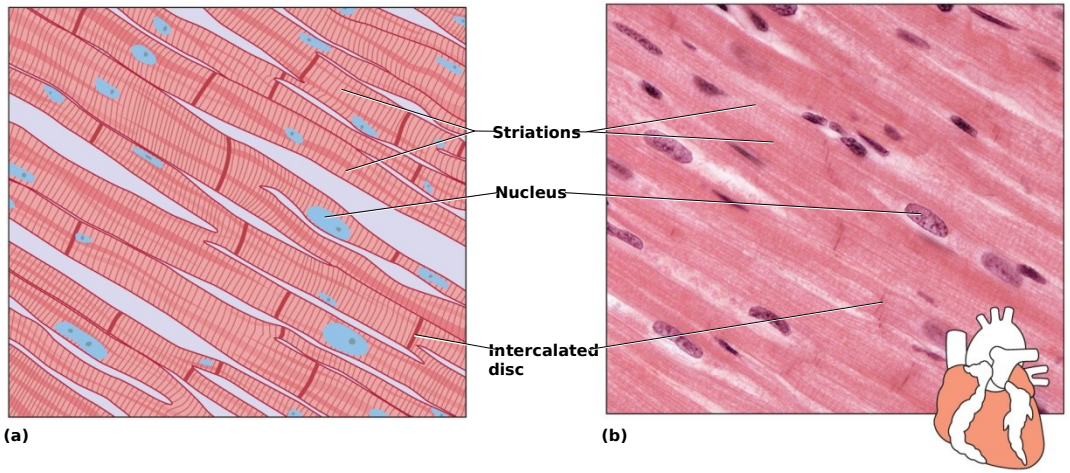

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Cardiac Muscle

5.6: Nervous Tissue

- **Found in brain, spinal cord, and peripheral nerves**

Functional cells are neuron

- **Neuroglial cells suppor and bind nervous tissue components**

Sensory reception

Conduction of nerve impulses

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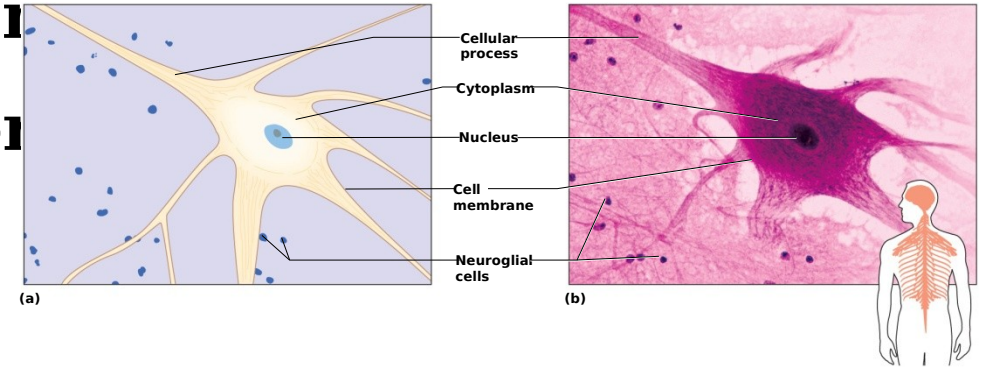

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